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1951 INVENTIONS IN MACHINE-TOOL BUILDING

Engr L. A. Ayzenshtadt

Model 1622 high-precision screw-cutting lathe -- for the development of which a group of workers, A. G. Filatov, G. Ye. Ganichenko, S. V. Livshits, A. D. Drozdov, B. K. Sarafanov, A. N. Gruzdev, and V. F. Sosipatrov, at the Moscow Krasnyy Proletariy and Stankolit Plants were awarded a Stalin Prize -- is intended for final threading of high-precision lead screws. Mastering the production of the new screw-cutting machines has made it possible to equip machine tools such as screw-cutting lathes, jig-boring, thread-milling, thread-grinding, gear-hobbing, and other machines with high-precision lead screws as a result of which the accuracy of these machine tools is increasing.

Model 1622 [see appended drawing] threads lead screws from 20 to 85 millimeters in diameter with a thread pitch of 3, 4, 5, 6, 8, 10, and 12 millimeters. The height of centers is 225 millimeters; and distance between centers, 2,500 millimeters. The use of a special rest designed by the Krasnyy Proletariy Plant permits the threading of lead screws up to 4,500 millimeters long with the threaded part 4,000 millimeters long.

Workers Z. I. Koval'chuk, F. A. Yudenkov, B. A. Kudinov, V. A. Glazkov, V. S. Nechayev, V. F. Potapov, D. M. Poshibaylov, S. A. Mossolov, and A. P. Koblov at the Kolomna Heavy Machine-Tool Building Plant, Design Bureau of the Ministry of Machine-Tool Building, and the [Yegor'yevsk] Komsomolets Machine-Tool Building Plant received a Stalin Prize for developing a large group of gear hobbing machines, including medium and heavy machines (Models 5325, 5326, 5327, 5D32, 5330, 5332, 5343, 5355, and 5355A).

50X1-HUM

Medium gear-hobbing machines perfected at the Komsomolets Plant can machine gears 50 to 100 millimeters in diameter and with 1 to 15-millimeter module. The machines are very rigid and for this reason can function under high

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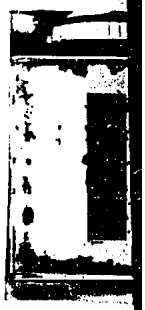


operating conditions (feed from 15 to 20 millimeters per revolution) with the use of high-duty hobs. Not only are individual parts on the machines unified but whole units as well.

Models 5327 and 5D32 are intended for general machine building plants. They are very universal. Various types of gears such as spur, helical and worm, using radial and tangential tool feeds, can be machined on them.

These machine tools are built with a sliding column and stationary table, which creates the most favorable ratio between the diameter of the dividing wheel and the maximum diameter of the workpiece.

Special requirements in respect to rigidity and prolonged maintenance of accuracy are placed on gear-hobbing machines operating in mass production at high speeds and feeds. In Models 5325 and 5326, these requirements, apart from the general composition, are met by the design of the tool spindle drive and the kinematic system, in conformance with which the main drive motor is located directly on the tool slide; this considerably shortens the hob driving chain, relieves the index chain from transmitting stresses necessary for the cutting process, and increases the machine tool's coefficient of efficiency.

The tool spindle drive in Models 5325, 5326, and 5327 is accomplished by a worm transmission. In this case, the pulsating reaction of the cutting stress is absorbed by the side surfaces of the worm and beyond that only a small portion of it is transmitted.

In contradistinction to earlier models of gear-hobbing machines, machine tools produced by the Komsomolets Plant are considerably more automatic. Gears can be processed on these machine tools with either down or up feed. In this connection, a special mechanism is provided which eliminates play in the nut of the vertical screw. Such a mechanism increases the durability of the tool an average of 50 percent.

Machine-tool models perfected by the Kolomna Heavy Machine-Tool Plant include both universal and heavy precision gear-cutting machines for processing large gears up to 5 meters in diameter.

The universal machine tools are intended for cutting spur, helical, and herringbone gears as well as worm gears. In addition to the basic method of operation, the generating method, the index milling method can also be used. High-duty mills (Progress, Pobeda, and others) with a feed of up to 12.5 millimeters per revolution (or with an insignificant change in the kinematic system, up to 25 millimeters per revolution), can be used on the machine tools.

The universal-type heavy machine tools are intended for cutting gears of the first, second (and lower) classes of accuracy. Their design is distinguished by its sound technology, the units and parts being unified.

Precision machine tools are intended for finish milling of gears, mainly for turbine reductors. They have a general kinematic system; parts and units of both allied models of machine tools of one type, and universal and precision machine tools of one size are unified.

A group of heavy roll grinding machines and roll lathes, Models 3415, 3415G, 3417V, and 1827S were perfected at the Kramatorsk and Khar'kov Machine Tool Building Plants. A group of designers, technologists, and production workers (N. A. Bondarchik, A. A. Ivanitskiy, F. P. Ovcharenko, A. S. Borovkov, V. A. Romm, T. V. Repin, E. A. Berlyavskiy, A. A. Sheryshev, A. A. Budyakov, and I. L. Shapiro) were awarded a Stalin Prize for their development.

Large cast-iron and steel rolls from 20 to 50 tons in weight for rolling mills and paper-making machines can be ground and turned on these machines.

Models 3415, 3415G, and 3417V roll grinding machines are intended for surface grinding of rolls up to 1,500 millimeters in diameter, and 4,500, 7,500, and 6,000 millimeters long. Cylindrical necks of rolls, as well as barrels with cylindrical, concave, and convex surfaces, can be ground on the machines. Regardless of its length, the roll neck is ground in one mounting.

The grinding-wheel spindle is very rigid, which makes it possible to use wheels up to 900 millimeters in diameter. Change pulleys of the V-belt transmission in the grinding-wheel drive, longitudinal feed drive, and the workpiece drive, permit, if necessary, an abrupt increase in the machining speed. In grinding the barrel surfaces, a convex-concave grinding mechanism is switched on. It is easily adjusted to the proper size; grinding is automatic.

The bed of the machine has an attachment for truing the centers of the head and tail stocks, as a result of which the working surfaces of the centers can be ground with a basic grinding wheel.

The roll lathes are unified; the powerful main drive and increased rigidity assure highly productive machining of rolls with a great deal of accuracy.

A workpiece can be machined at high cutting speeds on these machines with the use of hard-alloy tipped or high-speed steel cutters.

The spindle speed is changed smoothly by regulating the direct-current electric motor.

A Stalin Prize was awarded a group of designers and technologists (M. V. Shevchenko, A. M. Taraskevich, K. G. Beloborodov, S. M. Tsodokov, N. M. Shishov, and D. M. Sekretev) of the Design Bureau of the Ministry of Machine Tool Building and the /Moscow/ Machine-Tool Building Plant imeni S. Ordzhonikidze for developing a group of special machine tools for cutting tapered threads on petroleum pipes and couplings.

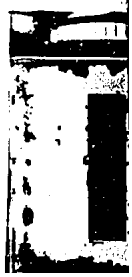
Pipes and couplings from 1-1/2 to 16-3/4 inches in diameter can be threaded on these machines.

The new machines are highly productive, free workers from heavy physical labor, and are convenient to operate, maintain, and repair. The operating cycle is automatic. The machines can cut both right- and left-hand threads without changing the gears in the feed box.

Series production of the new machine tools has been started at the Plant imeni Ordzhonikidze and the Stankokonstruktsiya Plant of the Ministry of Machine-Tool Building.

The workpieces machined on Models 9V143 and 9V145 pipe-threading machines are centered, clamped, and released automatically by a separate electric motor. Upon obtaining the predetermined clamping force, which is controlled by an overload relay, the motor switches off automatically and the clamping force is stabilized.

The coupling threading machines are equipped with a movable table. While the couplings which are mounted on one part of the table are being threaded, machined couplings are removed from another part of it (or they are turned around in a clamped position for threading on the opposite side). As a result, auxiliary time required is only 0.08-0.1 of a minute for one coupling.



A hydraulic drive is used for moving the table, centering, clamping, and releasing the workpiece.

Models 9V112 and 9V113 have two spindles, making it possible to thread two couplings at the same time.

A Stalin Prize was awarded for the first time to a group of designers and technologists in the field of press and forging-machine building. The winners of this prize are A. L. Borisov, A. I. Soplyakov, V. A. Ruzheynikov, and L. P. Verevkin [all of the Chimkent Presses and Automatics Plant]. This group headed the work in the development and perfection of automatics for hot and cold upsetting of balls and rollers.

The new designs of automatics, Models A148 and A148A, provide for the cold upsetting of products of sizes which previously had to be manufactured either by a method of hot upsetting (which required additional expenditures in connection with heating the rod, increasing allowances, and trimming burrs) or by machining on metal-cutting machine tools with a comparatively low productivity (one or two items per minute), and considerable steel going to waste in chips.

In comparison with the earlier method of manufacture, cold upsetting of balls and rollers on automatics saves up to 20 percent in bearing steel, with a high productivity (70 items per minute).

A group of inventors and engineers at the Moscow Frezer Plant, R. G. Bagdat'yev, A. I. Lapin, A. I. Grachev, N. F. Fesechko, A. A. Badayeva, N. G. Kotousov, and N. A. Yegorov, was awarded a Stalin Prize for the development of a new technology for the production of twist drills.

The new technology, developed and used first in the USSR, is based on obtaining spiral flutes and back edges (spinka) by a method of plastic deformation.

Depending on the size of the drills, different methods are used for their manufacture.

Spiral flutes and back edges of drills from 8 to 20 millimeters in diameter are obtained by longitudinal rolling and twisting, with subsequent pressing of the shank.

The productivity of one set of rolling mills is up to 8,000 drills per shift, that is, 12 times as fast as by the earlier method. The production area occupied by the equipment is half as great; the saving in high-speed steel amounts to 60 percent; and the durability of the drills produced by the new method is not less than that of milled drills.

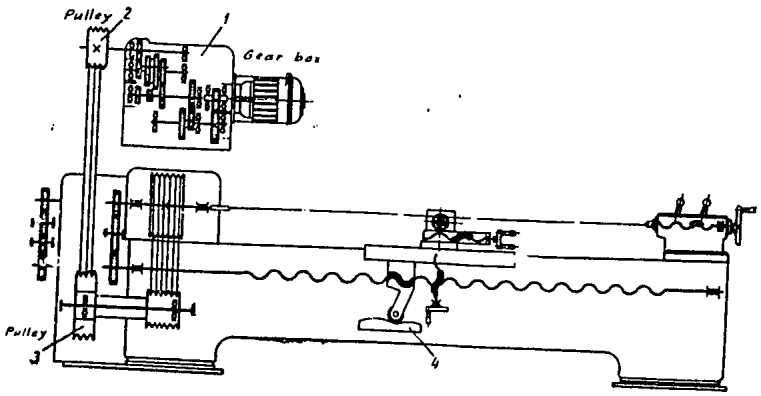
To obtain spiral flutes and back edges of cylindrical drills from 6 to 12 millimeters in diameter, a rolling method is used. The blank, fed automatically from the hopper to the inductor, after high-frequency current heating drops into the receptacle of a feed mechanism, is grasped by a moving flat-rolled die profiled in conformance with the profile of the spiral flute of the drill, and is rolled between it and a similar stationary die. After a single work-stroke of the ram of the modernized thread-rolling machine, a complete profile of spiral flutes and back edges is formed on the drill and no metal is wasted in chips.

High productivity (more than 30 percent higher than that of special milling automatics), a saving of up to 30 percent in metal, and increased hardness and durability of the tool characterize the new method of producing cylindrical drills. In addition, the amount of equipment used in the operation of forming the drill profile is decreased 19 times and the production area is decreased three times.

The cost of producing drills by the rolling method is approximately 50 percent lower than by milling. Their durability is equal.

[Appended drawing follows:]

Schematic Drawing of Model 1622
High-Precision Screw-Cutting Latne



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